Fall 9-1-2021

PHSX 215N.01: Fundamentals of Physics with Calculus I

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Physics 215N: Fundamentals of Physics with Calculus I Fall, 2021

Course Information

- Instructor: Dr. David A. Macaluso
- Office: C.H. Clapp Building, room 119
- Contact: david.macaluso@umontana.edu, 243-6641 (office)
- Lectures: MTWTr, 1:00 PM – 1:50 PM, CHCB 131
- Office Hours: MTW 2-3. I am happy to help students outside my normally scheduled office hours.

Course Description

This course will introduce students to the fundamental concepts of Classical Physics. We will explore Kinematics in 1-D/2-D and circular motion, Gravity, Work & Energy, Momentum, Fluids, and Oscillations & Waves. We will also concentrate on developing **problem solving skills** and **critical thinking skills**.

Textbook & Materials

- Required Text: *Physics for Scientists & Engineers with Modern Physics* by Giancoli, 5th edition (eText with all-inclusive Mastering Physics homework access)
- iClicker Remote - We will be using iClicker remotes extensively in this class. Because smartphone use is prohibited in class you will need an actual remote (smartphone apps will not be supported). Lecture iClicker content will start the first day of Week 2.

Add/Drop/Withdraw

Please refer to the University policy on adding, dropping, and withdrawing from the course at http://www.umt.edu/registrar/students/dropadd.php.

Through the 15th instructional day, ALL classes are dropped in CyberBear. From the 16th through the 45th instructional day, all classes must be dropped using Drop forms (instructor signature required, advisor signature required for undergraduates). **$10 fee applies.**
From the 46th to the last instructional day prior to finals week, classes must be dropped using the Drop form (instructor and Dean signatures required, advisor signature required for undergraduates). **$10 fee applies.**

Website(s)

1. Online homework: MasteringPhysics.com **2.** Grades and other materials will be posted on Moodle

General Learning Outcomes

Upon completion of this course, students should have gained:

1. A solid conceptual understanding of the foundational concepts of Classical Physics.
2. Appreciation for the methodology and activities scientists use to gather, validate and interpret data related to natural processes
3. Improved critical thinking and problem solving skills, such as detecting patterns, drawing conclusions, developing conjectures and hypotheses, and testing them by appropriate means.
4. An appreciation for the rigorous nature of scientific methodology in evidence-based inquiry, including how scientific laws and theories are verified by quantitative measurement, scientific observation, and logical/critical reasoning.
5. Insight into the thought processes of physical *approximation* and *modeling* and practice in the appropriate application of mathematics to the description of physical reality. This includes an understanding of how analytic uncertainty is quantified and expressed in the natural sciences

Specific Learning Outcomes

It is expected that the student will:

Kinematics

Apply knowledge of the relationships between time, displacement, distance, velocity, speed and acceleration to situations involving objects in one and two dimensions

Vectors

Perform vector analysis in one and two dimensions

Forces

Solve problems involving the force of gravity

Analyze situations involving the force due to friction

Solve problems that involve application of Newton's laws of motion in one and two dimensions

Energy

Perform calculations involving work, force, and displacement

Analyze the relationship between work, kinetic and potential energy, with reference to the law of conservation of energy

Solve problems involving power and efficiency

Linear Momentum

Apply the concept of momentum, impulse, and conservation of linear momentum in one and two dimensions

Rotation

Understand the relation between angular acceleration, rotational inertia and torque

Apply the concept of kinetic energy and work to rotation

Angular Momentum

Apply the concept of angular momentum to problems involving rotation and torque, with reference to the law of conservation of angular momentum

Equilibrium

Use knowledge of force, torque, and equilibrium to analyze various situations

Gravitation

Analyze the gravitational attraction between masses

Apply Kepler's laws and Newton's Law of Universal Gravitation to the motion of planets and satellites

Fluids

Understand the nature of compressible and incompressible fluids through a study of their density and pressure

Apply and Archimedes' Principle and Pascal's Principle to understand the forces and pressures exerted by fluids

Understand fluid flow by using the equation of continuity and Bernoulli's Principle

Oscillations and Waves

Apply the principle of Simple Harmonic Motion to the periodic motion of springs, pendulums and other oscillatory systems

Become familiarized with the nature of standing and traveling waves, and the Principle of Superposition

Expectations

This is a university-level physics course. The expectations are therefore appropriate for students who should all be familiar with the concepts of personal responsibility, accountability, and academic honesty. Specifically:

Attendance

Exams will be based on lectures and in-class problems and discussions. In addition, quizzes and iClicker lecture questions (points which ***cannot*** be made up without having made prior arrangements with me) represent a significant percentage of the course grade. Thus regular attendance, while not mandatory, is vital to student success. **I strongly encourage regular attendance – either in person or remote.**

Prerequisites/Corequisites

All students must have completed or be concurrently enrolled in the prerequisite/corequisite courses M171 or equivalent and PHSX 216N.

Reading Assignments

Students are expected to read the lecture material **before** class. Quizzes will be given during class that will be based at least partially on the reading. These quizzes will not be demanding, so reading ahead will both prepare you for the upcoming lecture and help assure you earn the "low hanging fruit" of reading quizzes.

Homework Assignments

Weekly homework assignments make up a large portion of your grade and are the primary tool by which you learn physics and develop your problem solving skills. These assignments usually take 2-5 hours to complete so don't procrastinate. **One "unit" represents 3 hours of student work and this is a 4-unit course, so it should occupy 12 hours per week; three hours and twenty minutes in-class, and *over eight hours* outside of class per week.**

Mathematics

The language of physics is math. You must be comfortable with algebra, geometry, trig and basic calculus.

Do not use cell phones or computers/laptops/notebooks in class. The only electronics permitted in class are your iClicker remotes and a dedicated calculator.

Grading Policy

Exams (three @ 15% each)	**45%**
Cumulative Final Exam	**20%**
Homework	**20%**
iClicker Questions	**15%**

Grades will be based on the traditional letter grade percentage scale (90s = A/A–, 80s = B+/B/B–, etc.). This course can only be taken with **the traditional grading option** (i.e. credit/no-credit is *not* allowed).

Final course grades are assigned based on the final student distribution. Students will not be given a lower grade than what is traditionally assigned to a given final percentage, e.g. a grade of 80% will be *at least* a B–.

Exam Policy

- All three midterm exams will occur ***on Monday evenings from 6-8 PM in the normal classroom*** (see attached schedule for the three exam dates).
- The Final Exam will take place in the normal classroom at the time designated by the university finals schedule (again, see the attached schedule for day/time).

Policies and Procedures

- You are **NOT** allowed to use a smartphone or any notes during the exams. You are only allowed a calculator and something to write with.
- **Late homework will not be accepted and there are no make-up exams unless prior arrangements have been made with me. Otherwise, late homework and missed exams will be scored as a zero.**
- This is a large lecture hall with approximately 50 students, so please:
  - Arrive on time as lectures begin promptly (with a "free" iClicker point).
  - Do not start packing your things early - I will (usually) not keep you late.
- Keep phones and tablets/laptops stored during lecture. **THIS IS A DEPARTMENT POLICY FOR THIS COURSE. Smartphones/computers are not allowed at any time in class or during exams.**
- All email correspondences with me must be to/from an official UM email address.

Academic Honesty

I encourage students to work together and to seek assistance from me whenever necessary. However, work submitted in this class must be the original work of the student. In addition, the majority of your grade will be based on quizzes and exams that test your mastery of the homework problems, so doing the problems on your own will give you the best chance to succeed.

University policy statement on academic honesty: All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Codes available at https://www.umt.edu/safety/policies/default.php.

Students with Disabilities:

Students with disabilities may request reasonable modifications by contacting me. The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. "Reasonable" means the University permits no fundamental alterations of academic standards or retroactive modifications. For more information, visit the Disability Services for Students website at https://www.umt.edu/dss/.

Covid Precautions and Expectations

We will be meeting in person but our room cannot accommodate social distancing, so we will follow University guidelines for this scenario:

- Students are required to wear masks at all times in class (if you cannot wear a mask for whatever reason, you need to see the **Office of Disability Equity** for further assistance before coming to class).
- For covid tracking, attendance and a record of the daily seating arrangement are required. I will be accomplishing this using iClickers (for attendance) and a wide-angle photograph of our *fixed seating chart* (for seating) at the beginning and end of each lecture.

Tentative Course Schedule (dates and topics subject to change)

Week	Chapters	Topics & Reading	Notes	Exams
Week 1 8/30	1, 2, 3	Intro, Measurement 1D Kinematics		
Week 2 9/06	3, 4	2 & 3D Kinematics Newton's Laws	**Labor Day, 9/6** *No Class Monday*	
Week 3 9/13	4, 5	Newton's Laws, *Friction, Circ., Drag*		
Week 4 9/20	5, 6	Newton's Laws & *Gravitation*		
Week 5 9/27	7, 8	Work & Energy, Conservation of E.		**Exam 1 (Ch. 1-6), 6-8 PM Monday, Sept 27**
Week 6 10/4	8, 9	Conservation of Energy, Lin. Mom.		
Week 7 10/11	9, 10	Linear Momentum Rotation		
Week 8 10/18	11, 12	Angular Momentum Equilibrium		
Week 9 10/25	12, 13	Equilibrium Fluids		**Exam 2 (Ch. 7-12), 6-8 PM Monday, Oct 25**
Week 10 11/1	13, 14	Fluids Oscillations		
Week 11 11/8	14 , 15	Oscillations Waves	**Veteran's Day, 11/11** *No Class Thursday*	
Week 12 11/15	15, 16	Waves Sound		
Week 13 11/22	16, 17	Sound, Intro to Thermo	**Thanksgiving Holiday** *No class Wed or Thurs*	
Week 14 11/29	17, 18, 19	Intro to Thermo, Kinetic Theory & Heat		**Exam 3 (Ch.12-16), 6-8 PM Monday, Nov 29**
Week 15 12/6	19, 20	1st and 2nd Laws of Thermodynamics	**Last Class Day** *Thursday, 12/9*	
Week 16 12/13		Finals Week	Final Exam in CHCB 131	**FINAL Wed., 12/15 1:10 – 3:10 pm**